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**PERFORMANCE ORIENTED PACKAGING TESTING
OF
TANK, POWDER, ALUMINUM, 16"/50, MK 4 MOD 0
FOR PACKING GROUP II SOLID HAZARDOUS MATERIALS**

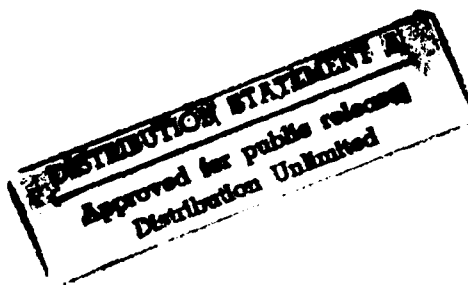
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6. AUTHOR(S) Lewis Coutts			
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13. ABSTRACT (Maximum 200 words) This Performance Oriented Packaging (POP) test was conducted to ascertain whether the Mk 4 Mod 0 16"/50 Aluminum Powder Tank (LD 58290) meets the Packing Group II requirements specified by the Code of Federal Regulations, Title 49 CFR, Parts 106 through 178, dated 1 October 1992. The packaged commodity used for the test was a simulated load weighing 182 kg (400 pounds). This represents the current maximum commodity weight plus an additional 30 kg (65 pounds) to compensate for future growth variations in commodity and/or packaging. Gross weight of the loaded tank was 216 kg (475 pounds). The test results indicate that the tank has conformed to the POP requirements.			
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INTRODUCTION

This Performance Oriented Packaging (POP) test was performed to ascertain whether the Mk 4 Mod 0 16"/50 Aluminum Powder Tank (LD 58290) meets the Packing Group II requirements specified by the Code of Federal Regulations, Title 49 CFR, Parts 106 through 178, dated 1 October 1992. The packaged commodity used for the test was a simulated load weighing 182 kg (400 pounds). This represents the current maximum commodity weight plus an additional 30 kg (65 pounds) to compensate for future growth variations in commodity and/or packaging. Gross weight of the loaded tank was 216 kg (475 pounds).

Due to unavailability only two tanks were used for testing. This is less than the number required by the regulations. Approval for this deviation has been granted by the Under Secretary of Defense, Memorandum for the Joint Logistics Commanders dated 22 February 1990. The tanks were identified as #1 and #2.

TESTS PERFORMED

1. Base Level Vibration Test

This test was performed in accordance with Title 49 CFR 178.608. Tank #1 was placed horizontally on a repetitive shock platform which has a vertical linear motion of 1-inch double amplitude. Movement of the tank was restricted during vibration in all but the vertical direction. The frequency of the platform was increased until the tank left the platform 1/16 of an inch at some instant during each cycle. Test time was 1 hour. This test was repeated with the container positioned vertically.

2. Stacking Test

This test was performed in accordance with Title 49 CFR 178.606. Tank #2 was used for this test. The tank was subjected to a force applied to its top surface equivalent to the total weight of identical packages stacked horizontally to a minimum height of 3 meters (including the test tank). A weight of 1,292 kg (2,850 pounds) was stacked on the test tank. The test was performed for 24 hours. The weight was then removed and the tank examined.

3. Drop Test

This test was performed in accordance with Title 49 CFR 178.603. Six drops were performed from a height of 1.2 meters (4 feet) in the following orientations (three drops for each orientation):

- a. Horizontally using tank #1.
- b. Diagonally on the edge between the cover assembly and the top ring of the tank using tank #2.

PASS/FAIL

1. Base Level Vibration Test

The criteria for passing the base level vibration test is outlined in Title 49 CFR 178.608(c): No test sample should show any deterioration which could adversely affect transportation safety or any distortion liable to reduce packaging strength.

2. Stacking Test

The criteria for passing the stacking test is outlined in Title 49 CFR 178.606(d): No test sample may show any deterioration which could adversely affect transportation safety or any distortion likely to reduce its strength, cause instability in stacks of packages, or cause damage to inner packagings likely to reduce safety in transportation.

3. Drop Test

The criteria for passing the drop test is outlined in Title 49 CFR 178.603(f): A package is considered to successfully pass the drop tests if for each sample tested, no rupture occurs which would permit spillage of loose explosive substances or articles from the outer packaging.

TEST RESULTS

1. Base Level Vibration Test

Satisfactory.

2. Stacking Test

Satisfactory.

3. Drop Test

Satisfactory.

DISCUSSION

1. Base Level Vibration Test (Vertical Orientation)

The tank was placed upright with the input vibration frequency set to 3.5 Hz. Immediately after the vibration test was completed, the tank was removed from the platform, turned on its side and inspected. No unfavorable distortion or deterioration was observed.

2. Base Level Vibration Test (Horizontal Orientation)

The tank was placed on its side with the input vibration frequency set to 4.1 Hz. Immediately after the vibration test was completed, the tank was removed from the platform, turned on its side and inspected. No unfavorable distortion or deterioration was observed.

3. Stacking Test

The tank was inspected after the 24-hour period was over. No unfavorable distortion or deterioration was observed.

4. Drop Test

After each drop, the tank was inspected. The contents were completely retained by the tank.

REFERENCE MATERIAL

A. Code of Federal Regulations, Title 49 CFR, Parts 106-178.

B. Bureau of Explosives Tariff No. BOE 6000K Hazardous Materials Regulations of the Department of Transportation by Air, Rail, Highway, Water including Specifications for Shipping Containers.

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TEST DATA SHEET

POP MARKING:	
UN 1B2/Y216/S/**/USA/DOD/NAD	
**YEAR LAST PACKED OR MANUFACTURED	
Nomenclatur: Mk 4 Mod 0 16"/50 Aluminum Powder Tank	
Type: 1B2	NSN: NSN 8140-00-310-2808
Drawing Number or P/N: DL 58290	Outer Packaging Material: Aluminum
Dimensions: 55.4" L x 20.25" dia	Gross Weight: 216 kg (475 pounds)
Closure (Method/Type): Twist on cover with rubber gasket	Tare Weight: 34 kg (75 pounds)
Additional Description: Cylindrical container with cover at end	
PACKAGED COMMODITY:	
Name: See table 1	NSN(s): See table 1
United Nations Number: See table 1	
United Nations Packing Group: II	
Physical State (Solid, Liquid, or Gas): Solid	
Vapor Pressure (Liquids Only): N/A At 50 °C: N/A At 55 °C: N/A	
Consistency/Viscosity: N/A	Density/Specific Gravity: N/A
Amount Per Container: See table 1	Flash Point: N/A
Net Weight: See table 1	
PACKAGED COMMODITY USED FOR TEST:	
Name: Simulated powder charges	Physical State: Solid
Consistency: N/A	Density/Specific Gravity: N/A
Test Pressure (Liquids Only): N/A	Net Weight: 182 kg (400 pounds)
Additional Description: The net weight includes the current maximum commodity weight plus an additional 30 kg (65 pounds).	

N/A = Not Applicable

TABLE 1
Commodities Approved for Shipping in the
Mk 4 Mod 0 16"/50 Aluminum Powder Tank

NALC/ DODIC	NSN	Commodity Nomenclature	Packing Document Number	Haz Class/Div	UN Number	Units/ Package	Total Net Weight kg (lb)	Total Gross Weight kg (lb)
D846	1320-01-230-4001	Charge, Propelling, 16"/50 Cal Full	DL 6107433 OR-68/128	1.3C	0242	3	152 (335)	186 (410)
D845	1320-00-089-9784	Charge, Propelling, 16"/50 Cal Reduced	DL 6107433 OR-68/128	1.3C	0242	3	64 (140)	98 (215)
D840	1320-00-089-9785	Charge, Propelling, 16"/50 Cal Reduced	DL 6107433 OR-68/128	1.3C	0242	3	64 (140)	98 (215)
B839	1320-01-139-1758	Charge, Propelling, 16"/50 Cal Full	DL 6107433 OR-68/128	1.3C	0242	3	152 (335)	186 (410)
B839	1320-01-125-2562	Charge, Propelling, 16"/50 Cal Full	DL 6107433 OR-68/128	1.3C	0242	3	152 (335)	186 (410)
J145	1340-01-371-6903	Mk 23 Mods JATO Rocket Motor	1133AS100	1.3C	0186	1	123 (272)	157 (347)